differential diagnosis at this stage includes thrombophlebitis. Every effort should be made to preserve as much motion as possible in a joint that shows early heterotopic ossification and, thus, passive range of motion is essential. In the early phases, when joint mobility is threatened, manipulation may be considered. At the first sign of heterotopic ossification, etidronate disodium therapy should be initiated because in some 16% of cases of heterotopic ossification, joint ankylosis will develop. In some patients treated with etidronate disodium, heterotopic ossification will continue to develop and it appears that a dosage of 20 mg per kg of body weight and a longer period of treatment may be necessary.

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REFERENCES

Garland DE, Blum CE, Waters RL: Periarticular heterotopic ossification in head-injured adults—Incidence and location. J Bone Joint Surg [Am] 1980 Oct; 62:1143-1146

Sazbon L, Najenson T, Tartakovsky M, et al: Widespread periarticular new-bone formation in long-term comatose patients. J Bone Joint Surg [Br] 1981 Feb; 63:120-125

Rehabilitation of Stroke Patients Who Have Associated Cardiac Disease

THE POTENTIAL FOR A combination of myocardial infarction and cerebrovascular accident, or stroke, to occur following a cardiac surgical procedure is well known. The rehabilitation of such patients with this combined problem must proceed with care so that the stroke rehabilitation program does not exceed a patient's exercise tolerance relative to the coexisting heart disease. This problem is illustrated by the fact that a hemiplegic patient who ambulates without bracing uses about 65% more energy in ambulating than does a normal person walking at the same speed. Similarly, a hemiplegic person uses up to 35% more energy in climbing stairs than does a normal person.

Recently a program has been designed for managing patients with combined cerebrovascular and cardiac diseases using principles of both stroke and cardiac rehabilitation.

This program proceeds in a stepwise fashion through steps 1 to 14 much as in a typical cardiac rehabilitation program. Although in the traditional cardiac program a patient advances one step a day, each step may take one or several days in a program for the combined disorder. The key to the combined program is careful control of energy expenditure varying from 1.12 METS (metabolic equivalent; 3.5 ml of oxygen per kilogram per minute) at step 1 to 9 METS at step 14. This planned energy expenditure is in keeping with standards for cardiac rehabilitation. Within the program as outlined, there are specific suggestions for physical and occupational therapy and ward activities.

Further specific guidelines include allowing a maximum heart rate of 110 a minute or less in the early steps and 120 a minute or less at step 14. Data for calculating maximal allowable heart rates by percent increase are also available as are further medical precautions such as ceasing activity with angina, and getting electrocardiograms and Holter monitor studies. As with routine cardiac rehabilitation, adequate warm-up and cool-down periods are necessary.

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REFERENCES

Blocker WP Jr, Kitowski VJ: Cardiac rehabilitation of the physically handicapped (amputee, hemiplegic, spinal cord injury, wheelchair, orthopedic patient), chap 34, *In* Blocker WP Jr, Cardus D (Eds): Rehabilitation in Ischemic Heart Disease. New York, Spectrum, 1983, pp 269-288

Kitowski VJ: Rehabilitation of patients with cardiac disease and associated cerebrovascular accident. South Med J 1979 Mar; 72:303-306

Staged Treatment of Spasticity

SPASTICITY IS PRESENT in central nervous system diseases such as stroke, spinal cord injury and multiple sclerosis. In patients with lifelong disability, the dangers of adverse effects and addiction are so significant that five stages of treatment have recently become established: (1) reassurance and education, (2) prevention and treatment of contributing causes, (3) physical therapy, (4) medication and (5) blocks and surgical procedures.

During the first stage, a physician needs to reassure and educate the patient and family about the following: spasticity retards muscle atrophy and decreases the chances of phlebitis occurring; an increase in spasticity is an invaluable diagnostic clue when patients cannot feel pain with the occurrence of lithiasis, decubiti, appendicitis or fractures; when spasticity is removed, patients may lose erections, bowel and bladder control, and may suffer further impairments in ambulation or transfers.

The second stage is that of amelioration of inflammation, infection, anxiety and agitation that may aggravate the spasticity. Support, relaxation and cognitive therapy are preferable to psychotropic drugs, many of which have hypotensive, anticholinergic, sedative or habituating side effects.

The third stage involves physical therapy (reducing contractures), functional training (moving the metatarsal heads off wheelchair pedals stops clonus) and physical modalities (heat at 38°C [100°F], ice to 15°C [59°F]).

Once the first three stages have been implemented, additional measures should be taken only when spasticity interferes with function or hygiene or produces significant discomfort.

The fourth stage involves medication. Baclofen, which inhibits reflexes in the spinal cord, is the first-line drug, except in patients who have a history of hallucinations or seizures. Dantrolene sodium, which has a direct effect on muscle, is the second-line drug; it occasionally produces a hepatotoxic reaction. Diazepam is the third drug. Its effectiveness is correlated in large measure with a sedative effect. It may produce urinary retention, respiratory depression and addiction. If an adequate response is not obtained with a single drug, two may be tried together. All three drugs taken simultaneously usually produce unacceptable side effects.

The fifth stage involves chemical neurolysis and surgical procedures. Motor point and nerve blocks are